5. In polyploids there is a limited amount of multi- and univalent formation during PMC meiosis, with consequent irregularities of chromosome number in the gametes.

6. In four tetraploid (but never in diploid) populations, individuals with different standard chromosome numbers (2n=42–44–45–46) have been observed.

7. No differences in the chromosome sets of male and female plants could be demonstrated.

8. In PMC meioses and pollen mitoses some consequences of spontaneous chromosome aberrations (bridges, fragments) have been found.

9. Chromosome sets of various diploids and polyploids are quite similar, but there are certain differences (e.g. in the SAT-chromosomes) as a result of structural changes.

10. Cytological findings are briefly discussed from comparative evolutionary and taxonomic viewpoints.

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A NEW SPECIES OF LYCIUM IN NEVADA

Cornelius H. Muller

A unique endemic *Lycium* occurs in Nevada in the area of the Atomic Energy Commission Nevada Test Site on Frenchman Flat. The plant was first discovered by Dr. William H. Rickard who remarked its extremely viscid, 4-merous corolla, and who suspected that it represented an undescribed species. It was collected in quantity by him, V. K. Carpenter, and Janice E. Beatley in the course of ecological investigations and subsequently by Dr. Beatley at my request. Material was submitted almost simultaneously to C. L. Hitchock and to me. Professor Hitchcock concurred in the opinion that the plant was undescribed and offered an analysis of its position in the genus but generously disclaimed any desire to undertake its publication. To him and to Dr. Beatley I am indebted for the opportunity to study this interesting material. Dr. Philip Wells has gathered considerable information on the distribution of the species. He discovered a large population on the southeasterly bajada of the Spotted Range and in northwestern Clark County. I am indebted to him for guidance to these localities.

The species typically grows on gravelly alluvium, predominantly limestone, in association with *Atriplex confertifolia* at the upper limit of *Larrea divaricata* and about the lower limit of *Coleogyne ramosissima*. It extends onto the playa clay on Frenchman Flat and onto quartzite beds on the lower slopes of the Spotted Range.

Lycium rickardii sp. nov. Frutex 0.5 m. altus, glaber; ramis albis spinosis; foliis 3–12 vel 18 mm. longis, 1.5–3 vel 6 mm. latis, 4–8-fasciculatis, obovatis vel spatulatis, floribus solitariis, pedicellis 0.5 mm. longis; calyce campanulato, tubo 6 mm. longo, lobis 4, 3 mm. longis; corolla tubuliformi, tubo 8–14 mm. longo, extra et intra viscido, lobis 4, circa 3 mm. longis; staminibus inclusis, corollae tubi partem supra mediam adhaerentibus, basi corollae intraque villosis; bacca subrotunda, 4–5 mm. longa, 2- vel 3-sperma, in calyce inclusa.

Intricately branched shrub about 0.5 m. tall or less; branchlets spinose, their smooth bark strikingly glaucous, weathering gray and fissuring after 2 or 3 years, the wood very soft and brittle; leaves 3 to 12 or even 18 mm. long, 1.5 to 3 or 6 mm. broad, in fascicles of 4 to 8, spatulate to obovate, the gradually narrowed base scarcely distinguishable from the blade, the apex broadly rounded, very thick and succulent, the midrib scarcely discernible in dried leaves, slightly glaucous green, the epidermal cells almost vescicular, giving the false impression of puberulence upon drying; flowers usually solitary in the leaf fascicles, the pedicels less than 1 mm. long; calyx highly variable, accrescent during and after anthesis, very succulent, the tube 6 mm. long, about 4 mm. broad, the 4 lobes 1 to 3 mm. long, mere teeth or broadly deltate-ovate, obtuse, broadly spreading or rarely erect; corolla white, the throat and veins suffused with purple or green, strictly tubular or narrowly funnel-shaped (the basal portion shrinking strongly upon drying), 8 to 14 mm. long, 2.5 to 3.5 mm. broad, the lobes about 3 mm. long, ovate, apically rounded, rotate or reflexed with age, 4-merous but a fifth lobe sometimes represented by a vascular bundle and an abortive petal, both outer and inner surfaces markedly viscid-glandular (this not apparent in dried material); stamens as many as the corolla lobes, an abortive petal sometimes carrying a full-sized staminode; filaments equal, plain, adnate about 3/4 to 4/5 the height of the tube, strikingly pubescent with long hairs in the basal 1/3 or 1/2 of their length; anthers included by the throat; gynoecium bilocular, glabrous, with thin yellow walls, on a

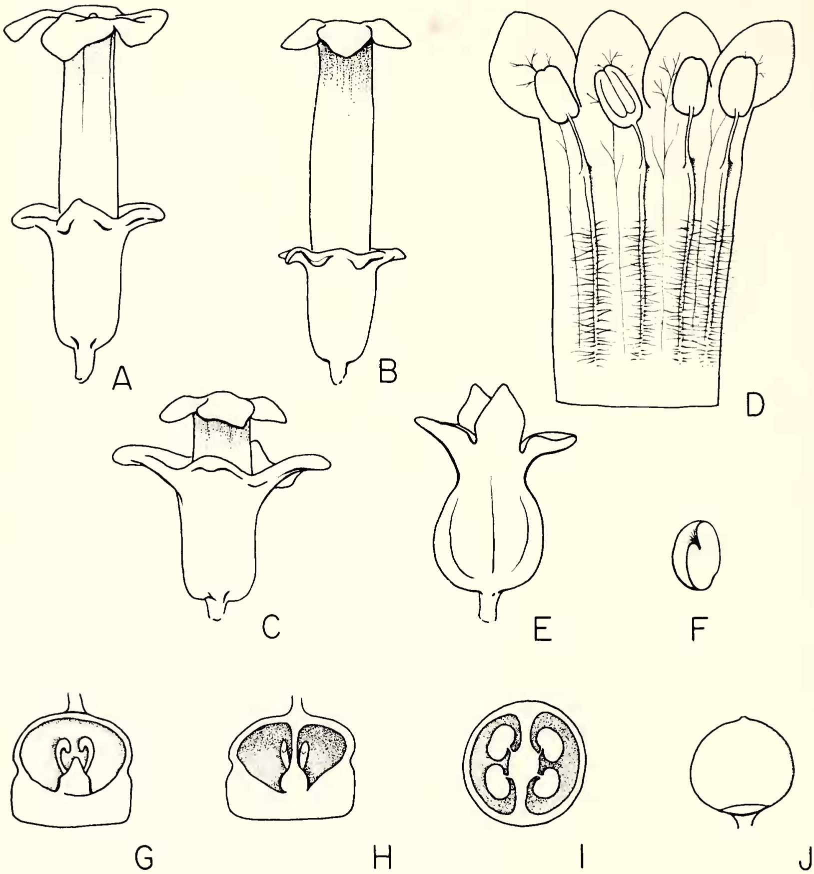

FIG. 1. *Lycium rickardii* sp. nov.: A–C, flowers, × 3; D, interior of corolla, × 3; E, fruiting calyx, × 3; F, mature seed, × 3; G, longitudinal section of ovary at anthesis parallel to the septum showing a pair of ovules on a single placenta, × 9; H, longitudinal section of ovary at anthesis at right angles to the septum showing one of each pair of ovules on each placenta, × 9; I, cross section of ovary, × 9; J, mature fruit, × 3. Drawn by Isabelle Haller from fresh material (*Beatley 2, 3, 4* and *Muller 10945*) except in the instances of F and J which were based on *Rickard* and *Beatley,* 2 May 1959.

thickened bright red disc, each locule 2-ovulate, no abortive ovules and no lower cells developing in the disc; style at anthesis reaching about half the length of the corolla; stigma green, slightly 2-lobed, irregular; fruit subrotund, about 4 or 5 mm. long and broad, completely enclosed in the accrescent, urceolate calyx and surmounted by the constricted throat and divergent sepals, the exocarp cartilaginous, the disc remaining red and slightly fleshy but not enlarging with the fruit, 1 or 2 seeds maturing in each locule of the ovary, thus producing a 2-seeded or, more often, a 3-

seeded fruit, the seeds flattened on the common face, about 3 or 4 mm. long, minutely pitted, the aborted ovule(s) always in the original position.

NEVADA. Nye County: codominant in shadscale scrub at 4100 feet on south-facing bajada of the Spotted Range, 16.6 miles west of Indian Springs, 8 April 1961, *Muller 10940, 10941, 10943, 10944, 10945* (holotype UCSB, sheet no. 8765), *10946, 10947*; codominant in shadscale scrub at 4200 feet in southerly foothills of the Spotted Range, ½ mile above the highway and 16.6 miles west of Indian Springs, 8 April 1961, *Muller 10948, 10949, 10950*; "east of playa" on Frenchman Flat, 2 May 1959, *Rickard* and *Beatley s.n.* (from which the fruit is described); "south of playa, near Lycium Plot 4;" "northwest of playa;" "near playa":[1] all on Frenchman Flat, 2 April 1959, *Rickard, Carpenter,* and *Beatley s.n.*; with *Larrea* and *Atriplex* south of playa at 3100 feet on Frenchman Flat, 11 April 1961, *Beatley 2*; with *Larrea* south of playa at 3100 feet on Frenchman Flat, 11 April 1961, *Beatley 3;* with *Larrea* east of playa at 3100 feet on Frenchman Flat, 11 April 1961, *Beatley 4.* Clark County: rare in shadscale scrub at edge of foothills 1½ miles south of Indian Springs, 8 April 1961, *Muller 10951.*

All specimens cited are deposited in the herbarium of the University of California, Santa Barbara, and duplicates are being distributed.

Lycium rickardii negotiates Hitchcock's key (1932) past *L. pallidum* Miers (p. 202) but fits neither "G. Fruit 2–4-seeded, with 1 or 2 fertile seeds in the top of each carpel, and abortive ovules in compartment below" nor "GG. Fruit not as above, with more than four seeds." Rather, each locule contains two ovules, and there is no division of the locule into compartments as in *L. macrodon* and *L. puberulum.* If one ovule aborts, it appears on the same placenta and in the same locule with the matured seed. In this respect *L. rickardii* agrees with *L. shockleyi* Gray, an emended description of which was published by Muller (1940). The Hitchcock (1932) key may be emended as follows:

G. Fruit 2–4 seeded.
- H. Fruit with each carpel divided into two locules, the upper bearing 1 or 2 seeds and the lower locule bearing aborted ovules; calyx not enclosing fruit. . . . *L. macrodon* and *L. puberulum*
- HH. Fruit with one locule to each carpel, the seeds or abortive ovules totalling 2 in each locule; calyx enclosing fruit.
  - I. Fruit with an irregular suture or fold on one or both sides, filaments adnate nearly full length, the anthers appearing almost sessile. . . *L. shockleyi*
  - II. Fruit lacking a suture or fold, filaments free in upper ¼ of ⅕ of their lengths . . . . *L. rickardii*

GG. Fruit with more than 4 seeds. . . . . *L. cooperi* et seq.

The relationship of *L. rickardii* to *L. shockleyi* is apparent in the number of ovules in each carpel, the lack of a lower compartment with abortive ovules, and the 4-merous condition. However, the partially free filaments and lack of a suture or fold on the side of the fruit clearly distinguish it from *L. shockleyi.* Its fruit and stamen characters suggest *L. californicum* Nutt. ex Gray, but in the latter species the corolla is much smaller with proportionately shorter lobes and each locule contains a

[1] The latter two collections bear the following notes: "Corollas 4-merous, shining viscid within and without; shrub less than 2 feet high."

single ovule. Professor Hitchock (personal letter to William H. Rickard, 22 November 1960) pointed out the intermediacy of *L. rickardii* between *L. californicum* and "such species as *L. macrodon* and *L. puberulum*." It might be added that both *L. rickardii* and *L. shockleyi* stand in this position with *L. rickardii* closer to *L. californicum* and *L. shockleyi* more similar to *L. macrodon* Gray, *L. puberulum* Gray, and *L. cooperi* Gray.

It is extremely likely that *L. rickardii* is somewhat more widely distributed than at present known. In the rather copious material at hand there is no evidence that heavy doses of irradiation at the Test Site are in any way responsible for the characters of *L. rickardii*. The longevity of these plants insures their being older than the Test Site, and their essential uniformity with those of the southerly and southeasterly range of the species makes it highly unlikely that the characters here noted might have arisen as a result of somatic mutation.

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SOME RECENT OBSERVATIONS ON PONDEROSA, JEFFREY AND WASHOE PINES IN NORTHEASTERN CALIFORNIA

John R. Haller

In an earlier paper (1959), I suggested that *Pinus jeffreyi* Grev. and Balf. is less susceptible to cold than is *P. ponderosa* Dougl. ex Lawson, and that for this reason *P. jeffreyi* replaces *P. ponderosa* at high altitudes in the mountains of California. Dr. Willis W. Wagener reported recently (1960), however, that established trees of *P. ponderosa* survived at least as well and occasionally better than *P. jeffreyi* following periods of severe cold in northeastern California. The purpose of the present paper is to present additional information on the pines of northeastern California which I believe will show that there is no discrepancy between Wagener's observations and my own, and that, in fact, they even reinforce one another.

In our respective papers, Dr. Wagener and I were discussing examples from different areas—his from northeastern California, mine mostly from cismontane California, that portion of the state lying to the west of the Sierra-Cascade crest. I deliberately omitted a discussion of the